SCHEDULED AND AUTONOMOUS TRANSMISSION AND ACKNOWLEDGEMENT

PRIORITY

This application is a Continuation Application which claims priority to U.S. application Ser. No. 11/490,228, filed on Jul. 19, 2006 which is a Divisional of U.S. application Ser. No. 10/646,955, filed Aug. 21, 2003 (U.S. Pat. No. 7,155,233 issued on Dec. 26, 2006) which claims priority to U.S. Provisional application No. 60/470,770, filed on May 14, 2003, and U.S. Provisional application No. 60/452,790, filed on Mar. 6, 2003, and U.S. Provisional application No. 60/448,269, filed on Feb. 18, 2003.

FIELD

The present invention relates generally to wireless communications, and more specifically to a novel and improved method and apparatus for scheduled and autonomous transmission and acknowledgement.

Wireless communication systems are widely deployed to provide various types of communication such as voice and data. These systems may be based on code division multiple access (CDMA), time division multiple access (TDMA), or some other multiple access techniques. A CDMA system provides certain advantages over other types of systems, including increased system capacity.

A CDMA system may be designed to support one or more CDMA standards such as (1) the "TIA/EIA-95-B Mobile Station-Base Station Compatibility Standard for Dual-Mode Wideband Spread Spectrum Cellular System" (the IS-95 standard), (2) the standard offered by a consortium named "3rd Generation Partnership Project" (3GPP) and embodied in a set of documents including Document Nos. 3G TS 25.211, 3G TS 25.212, 3G TS 25.213, and 3G TS 25.214 (the W-CDMA standard), (3) the standard offered by a consortium named "3rd Generation Partnership Project 2" (3GPP2) and embodied in "TR-45.5 Physical Layer Standard for cdma2000 Spread Spectrum Systems" (the IS-2000 standard), and (4) some other standards.

In the above named standards, the available spectrum is shared simultaneously among a number of users, and techniques such as power control and soft handoff are employed to maintain sufficient quality to support delay-sensitive services, such as voice. Data services are also available. More recently, systems have been proposed that enhance the capacity for data services by using higher order modulation, very fast feedback of Carrier to Interference ratio (C/I) from the mobile station, very fast scheduling, and scheduling for services that have more relaxed delay requirements. An example of such a data-only communication system using these techniques is the high data rate (HDR) system that conforms to the TIA/EIA/IS-856 standard (the IS-856 standard).

In contrast to the other above named standards, an IS-856 system uses the entire spectrum available in each cell to transmit data to a single user at one time, selected based on link quality. In so doing, the system spends a greater percentage of time sending data at higher rates when the channel is good, and thereby avoids committing resources to support transmission at inefficient rates. The net effect is higher data capacity, higher peak data rates, and higher average throughput.

Systems can incorporate support for delay-sensitive data, such as voice channels or data channels supported in the IS-2000 standard, along with support for packet data services

such as those described in the IS-856 standard. One such system is described in a proposal submitted by LG Electronics, LSI Logic, Lucent Technologies, Nortel Networks, QUALCOMM Incorporated, and Samsung to the 3rd Generation Partnership Project 2 (3GPP2). The proposal is detailed in documents entitled "Updated Joint Physical Layer Proposal for 1xEV-DV", submitted to 3GPP2 as document number C50-20010611-009, Jun. 11, 2001; "Results of L3NQS Simulation Study", submitted to 3GPP2 as document number C50-20010820-011, Aug. 20, 2001; and "System Simulation Results for the L3NQS Framework Proposal for cdma2000 1xEV-DV", submitted to 3GPP2 as document number C50-20010820-012, Aug. 20, 2001. These, and related documents generated subsequently, such as Revision C of the IS-2000 standard, including C.S0001.0 through C.S0006.C, are hereinafter referred to as the 1xEV-DV proposal.

In order to coordinate usage of the forward and reverse link in an efficient manner, a system, such as the 1xEV-DV proposal, for example, may need various signaling mechanisms for controlling transmission between one or more base stations and one or more mobile stations. For example, mobile stations may need a mechanism to coordinate their data transmissions on the reverse link. Mobile stations will be, in general, scattered throughout a cell's coverage area, and will need varying amounts of transmission power by the base station for communicating signals or commands effectively on the forward link as well as by the mobile station for transmitting data on the reverse link. A relatively distant, or low geometry, mobile station may require higher power forward link commands as well as higher power reverse link transmission than a relatively close, or high geometry, mobile station. In either case, signaling to coordinate access of a shared resource uses a portion of the shared resource, and thus reduces overall capacity. Examples of such signaling include access requests, access grants, and acknowledgements of received data transmissions.

As is well known in wireless system design, when a channel can be transmitted using less power for the same reliability, the capacity of the system may be improved. Furthermore, reducing the amount of coordination overhead while keeping a shared resource, such as a communication link, fully loaded will also improve capacity. There is therefore a need in the art for efficient transmission scheduling and coordination as well as reducing system loading allocated to such coordination.

SUMMARY

Embodiments disclosed herein address the need for efficient signaling to and from a plurality of mobile stations. In one embodiment, a subset of mobile stations may be allocated a portion of the shared resource with one or more individual access grants, another subset may be allocated a portion of the shared resource with a single common grant, and yet another subset may be allowed to use a portion of the shared resource without any grant. In another embodiment, an acknowledge and continue command is used to extend all or a subset of the previous grants without the need for additional requests and grants, and their associated overhead. In one embodiment, a traffic to pilot ratio (T/P) is used to allocate a portion of the shared resource, allowing a mobile station flexibility in selecting its transmission format based on T/P. Various other aspects are also presented. These aspects have the benefit of providing efficient utilization of the reverse link capacity, accommodating varying requirements such as low-latency, high throughput or differing quality of service, and reducing